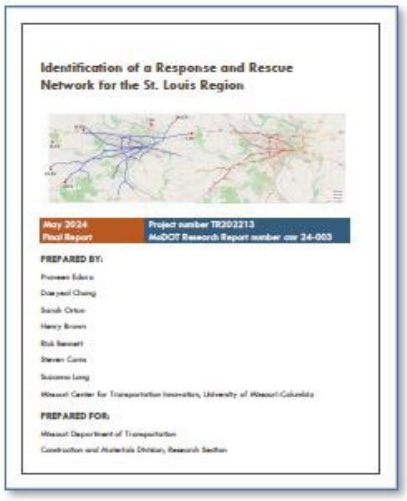
For more information contact: Jenni Hosey (573) 526-4493

Research Summary

Identification of a Response and Rescue Network for the St. Louis Region



Emergency preparedness and response are critical to saving lives and minimizing suffering during and after natural disasters. The St. Louis metropolitan area is vulnerable to large earthquakes in the New Madrid Seismic Zone (NMSZ) and Wabash Valley Seismic Zone (WVSZ) and sporadic seismic activity to the east and south of the region. Earthquakes' high frequency and magnitude make the St. Louis area particularly vulnerable. The large population, significant population density, numerous river crossings, and unreinforced building construction practices increase the potential for substantial damage and the difficulty of recovery efforts in the St. Louis region. Damage to road infrastructure, especially bridges, also constrains emergency response, evacuation, and recovery. This study addresses the transportation impacts of earthquakes in the St. Louis area.

An online survey was deployed to understand citizens' behavior and decision making in an evacuation. Survey responses were collected across the eight counties in the study region to obtain information on the decision to evacuate, departure time, route and destination choice, vehicle usage, and others. The survey responses were used to adjust the regional travel demand model to study various evacuation scenarios.

The regional travel demand model for the St. Louis region developed by East-West Gateway Council of Governments was obtained and served as the base model for the study. It consists of approximately 7.9 million daily trips. The CUBE simulation tool was used to study the effects of earthquakes in the region. Infrastructure damage estimates were obtained through the United States Geological Survey ShakeCast model for a magnitude 6.7 earthquake.

"Earthquakes' high frequency and magnitude make the St. Louis area particularly vulnerable."

Performance measures were collected at regional and local levels. Average vehicle speed, operating speed-to-speed limit ratios, and a list of bottlenecks were generated. The earthquake scenarios were assumed to occur at two different times of day, 7 A.M. and 4 P.M. The existing travel demand model represented a baseline scenario, and twelve evacuation scenarios were created by varying travel demand, road network, and earthquake occurrence time. Twelve evacuation scenarios were assessed using simulation. The scenarios varied based on the level of damage to the road network, evacuation demand, and timing of the earthquake. Average network speeds for the scenarios are shown in

Figure 1. Results showed that morning earthquakes resulted in the worst traffic impacts. Mesoscopic models confirmed severe congestion on MO 100 and identified bottlenecks on I-170 and US 67.

A tabletop exercise was conducted with key emergency response stakeholders in the St. Louis region to better understand coordination and communication needs during an earthquake response. The stakeholders included Missouri Department of Transportation (MoDOT), local law enforcement, local emergency management, health care, and other pertinent agencies. The exercise covered effective communication, coordination needs, anticipated infrastructure damage, and essential support resources. Participants emphasized the importance of comprehensive support covering food, water, and medical services, combined with challenges related to supply chain management and infrastructure issues (e.g., communication systems) to address emergency response effectively.

This study aims to equip stakeholders with tools for effective response, aiding emergency responders, urban planners, and policymakers in minimizing the impact of an earthquake in the St. Louis region.

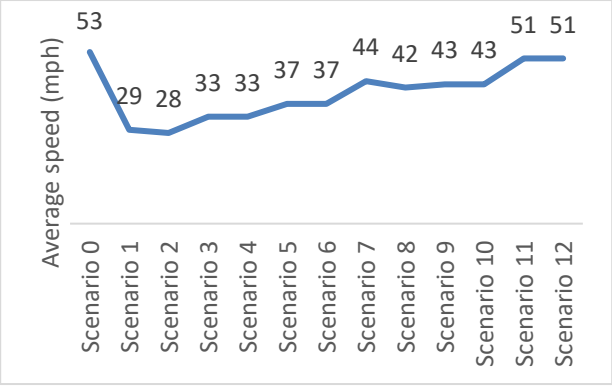


Figure 1: Average speed across scenarios.

Project Information

PROJECT NAME: TR202213—Identification of a Response and Rescue Network for the St. Louis Region

PROJECT START/END DATE: May 2022-May 2024

PROJECT COST: $224,999

LEAD CONTRACTOR: MCTI/University of Missouri-Columbia

PRINCIPAL INVESTIGATOR: Praveen Edara

REPORT NAME: Identification of a Response and Rescue Network for the St. Louis Region

REPORT NUMBER: cmr 24-003

REPORT DATE: May 2024

Project Manager

CONTACT INFORMATION:

Jenni Hosey
Senior Research Analyst
Missouri Dept. of Transportation
1617 Missouri Blvd.
Jefferson City, MO 65109
(573) 526-4493
Jennifer.J.Hosey@modot.mo.gov